APPLICATION OF TIERS 1,2, & 3 FOR ASRC BOILER PROPOSED REGULATION 5.22, SECTIONS 2, 3 & 4

KENTUCKIANA ENGINEERING CO., INC.
311 TOWNEPARK CIRCLE, SUITE 100
LOUISVILLE, KY 40243
502-489-8074
502-489-8078 FAX

ASRC SINGLE COAL BOILER Cr(VI) TIER 1, 2 AND 3 MODELING*

- TIER 1 PROCEDURE & INPUTS
- TIER 1 RESULTS
- TIER 2 PROCEDURE & INPUTS
- TIER 2 RESULTS
- TIER 3 PROCEDURE & INPUTS
- TIER 3 RESULTS

* Chronic Risk for Cr(VI) not Evaluated in Tiers 1, 2 or 3

TIER 1 PROCEDURE & INPUTS

- Determine TAC Averaging Time(s) per Regulation 5.20
- Determine BAC Simple Factor(s) per Table 1, Regulation 5.22, Section 2.2
- Determine BAC_c for Each TAC per Regulation 5.20, Sections 3, 4 & 5
- Calculate Allowed $Emission_{ij}$ for Each TAC for Each Emission Point per Equations 1 through 4 per Regulation 5.22, Section 2 for the BAC_c

ASRC BOILER Cr(VI) TIER 1 RESULTS

- Averaging Time Per Regulation 5.20 = Annual
- Simple Factor(s) per Table 1 Regulation 5.22
  - Annual Factor (F_A) = 480
  - 1-Hr Factor (F_1) = 0.54
- BAC_c for Cr(VI) Per Regulation 5.20=$1x10^{-6}$ /URE,
  - URE for Cr(VI) = 1.20×10^{-2} (per IRIS)
  - $BAC_c = 1x10^{-6} / 1.20 \times 10^{-2} = 0.000083$ ug/m^3
- Max $Concentration_{ij}$ for Cr(VI) = BAC_c x 1.0 for an Existing Emission Point per Regulation 5.21, Section 2.5.1, which is the EAL_C*

* The EAL is 1.0 for Chromium Compounds from a single emission point. Per Regulation 5.20 the R_c (Risk) is calculated by dividing Max Concentration for the TAC by the BAC_c. The Max Concentration, therefore, is equal to the BAC_c in order for the Risk to be equal to 1.0, which is the EAL.

ASRC BOILER Cr(VI) TIER 1 RESULTS

- Max Concentration$_{ij}$ = Allowed Annual Emission$_{ij}$ / F_A or Allowed Annual Emission$_{ij}$ / F_1 whichever provides the highest Max Concentration$_{ij}$
  - Max Concentration$_{ij}$ (Annual) = Allowed Annual Emission$_{ij}$ / 480, or 0.000083ug/m^3 x 480 (lb/yr)/(ug/m^3) = 0.0408 lb/yr
  - Max Concentration$_{ij}$ (1-Hr) = Allowed Annual Emission$_{ij}$ / 0.54, or 0.000083ug/m^3 x 0.54 (lb/hr)/(ug/m^3) = 0.0000448 lb/hr, for an Operating Year of 8,760 hrs = 0.392 lb/yr
- Since the F_A Produces the Lowest Annual Allowable Emission Rate, the Allowed Annual Emission from Tier 1 Modeling is 0.0408 lb/yr. PTE of Cr(VI) is 6.263 lb/yr.
- Conclusion – Tier 2 Analysis is Required.

TIER 2 PROCEDURE & INPUTS

- Determine TAC Averaging Time per Regulation 5.20
- Acquire Scaled 3-D Drawings & Coordinates of Entire Facility
- Determine Each Emission Point's Parameters for:
  - Stack Discharge Height (H_s) in ft
  - Height of Influential Building (H_b)
  - Distance from Stack Base to Nearest Secured Fence Line (ft)
- Calculate the H_s / H_b Ratio, if > 2.5, use 2.5
- Use Table 2 of Regulation 5.22 to Look Up the Annual Factor
- Calculate the Max Concentration$_{ij}$ Using Equation 5
- Calculate the Allowed Annual Emission$_{ij}$

ASRC BOILER Cr(VI) TIER 2 RESULTS

- ASRC Boiler Emission Point's Parameters:
  - Stack Discharge Height (H_s) in ft = 180, must round down to max of 125 ft for Building Height of 50 ft
  - Height of Influential Building (H_b) in ft = 50
  - Distance from Stack Base to Nearest Secured Fence Line (ft) = 138.4, must round down to 100 ft
- H_s / H_b Ratio = 180/50 = 3.6, must use 2.5
- Table 2 Inputs Are, Therefore:
  - Building Height of 50 ft
  - H_s / H_b Ratio of 2.5
  - Distance to Fence Line = 100 ft
  - Stack Height = 125 ft

ASRC BOILER Cr(VI) TIER 2 RESULTS

- Table 2 Annual Factor = 4.630 (lb/hr)/(ug/m^3)
- Max Concentration$_{ij}$ = Allowed 1-Hr Emission$_{ij}$ / Annual Factor
  - Max Concentration$_{ij}$ =Allowed 1-Hr Emission$_{ij}$ / 4.63, therefore
  - Allowed 1-Hr Emission$_{ij}$ =0.000083ug/m^3 x 4.630(lb/hr)/(ug/m^3) = 0.000384 lb/hr
- Allowed Annual Emission =0.00038 lb/hr x 8760 hr/yr =3.366 lb/yr. PTE is 6.263 lb/yr.
- Conclusion – Tier 3 Analysis Required.

TIER 3 PROCEDURE & INPUTS

- Determine TAC Averaging Time per Regulation 5.20
- Acquire Scaled 3-D Drawings & Coordinates of Entire Facility
- Determine Each Emission Point's Parameters for:
  - Stack Discharge Height & Diameter in meters
  - Stack Discharge Temperature in degrees Kelvin
  - Stack Discharge Exit Velocity in meters/second
  - Height of Influential Building in meters
  - Distance from Stack Base to Nearest Secured Fence Line, meters
  - Width & Length of Influential Building in meters
  - TAC Emission Rate in grams/second
- Acquire and Install SCREEN3 and/or TSCREEN Models

TIER 3 PROCEDURE & INPUTS

- Input Emission Point Parameters and Site Parameters into Model, Following Order Requested by the Model
- Enter Distance Radii Desired for Calculation of Concentrations at Various Distances
- Review and Determine if Additional Runs Are Needed
- Determine Adjustment Factor Per Regulation 5.22, Section 4.2
- Adjust Max Concentration Produced by Model by Factor in Section 4.2
- Calculate Compliance with EAL per Equations 1 through 5, Regulation 5.21, Sections 2.2 through 2.6

ASRC BOILER Cr(VI) TIER 3 RESULTS

- TAC Averaging Time per Regulation 5.20 = Annual
- Stack Discharge Height in meters = 53.34
- Stack Diameter in meters = 2.21
- Stack Discharge Temp in Kelvin = 341.48
- Stack Exit Velocity in meters/second = 18.04
- TAC Emission Rate grams/second = 0.00009
- Height of Influential Building in meters = 15.24
- Width & Length of Influential Building = 12.04 x 21.07 m
- Distance from Stack Base to Nearest Secured Fence Line in meters = 42.2
- Receptor Distance Spacing = used 100 out to 5 km

ASRC BOILER Cr(VI) TIER 3 RESULTS

- Results of SCREEN3 Model:
  - Max Concentration was 0.000453 ug/m^3 1-hr average
  - Distance at Max Concentration was 1841 meters from the stack
- Adjustment Factor per Regulation 5.22, Section 4.2 = 0.02 (going from 1-hr concentration to an annual concentration)
- Max Annual $Concentration_{ij}$ = 0.000453 ug/m^3 x 0.02 = 0.000009 ug/m^3
- Risk R_c = Max Annual $Concentration_{ij}$ / BAC_c per Equation 1 of Regulation 5.20, Section 2.5 = 0.000009 ug/m^3 /0.000083 ug/m^3 = 0.108

ASRC BOILER Cr(VI) TIER 3 RESULTS

- Allowable Risk, EAL_c =1.0 and Tier 3 Results Show R_c =0.108
- Allowable Emissions = 6.263/.108 = 57.991 lb/yr. PTE is 6.263 lb/yr.
- Conclusion – Cr(VI) Emissions from the Single Coal Boiler Comply Using the Tier 3 SCREEN3 Model.

AIR DISPERSION MODELING OF ASRC BOILERS USING ISC3 MODEL PROPOSED REGULATION 5.22, SECTION 5, TIER 4

KENTUCKIANA ENGINEERING CO., INC.
311 TOWNEPARK CIRCLE, SUITE 100
LOUISVILLE, KY 40243
502-489-8074
502-489-8078 FAX

ASRC BOILERS

- 2 SPREADER STOKER COAL FIRED BOILERS
  - ATOMIZED LIME SLURRY SO_2 SCRUBBERS
  - 12 MODULE REVERSE BAGHOUSE FOR PARTICULATE EMISSIONS
- 2 PACKAGE NATURAL GAS BOILERS
- BOTH UNITS MODELED AT ALLOWABLE EMISSION RATES (POTENTIAL TO EMIT) – NOT THE ACTUAL OPERATING RATE

ASRC BOILERS

- PERMITTED IN 1990 UNDER PREVENTION OF SIGNIFICANT DETERIORATION REVIEW
- MEET BEST AVAILABLE CONTROL TECHNOLOGY
- BASED ON NEW FEDERAL BOILER MACT RULE, BOILER CONTROL EQUIPMENT MEETS MAXIMUM AVAILABLE CONTROL TECHNOLOGY

INTRODUCTION

- PRACTICAL MODELING EXAMPLE
  - COAL FIRED/NATURAL GAS FIRED BOILERS
- AT THE REQUEST OF BOARD
  - Familiarize Board and Staff with modeling requirements
  - Provide a forum for discussion concerning modeling

MODEL SELECTION

- SCREEN3 AND TSCREEN – Tier 3
  - Models only one stack or one fugitive source at a time
- ISC3 – Tier 4
  - Models multiple sources
  - Models multiple averaging periods
  - Accepts NWS hourly met data

ISC3 MODEL SELECTED

- Tier 4 Option
- Model multiple sources
- Uses NWS Meteorological data
- Used Regulatory Default Option as required by EPA
- Graphical User Interface by Lakes Environmental
  - DOS version available at the EPA website does not give graphical representation of data for error checking

PLANT DATA

- SITE PLAN MAP
  - Map, Plant Boundary, Buildings, Stacks, UTM Coordinates (X,Y,Z)
- BUILDING DIMENSIONS AND LOCATIONS
  - Height, Width, # of Tiers, UTM Coordinates (X,Y,Z)
- STACK DATA
  - Height, Diameter, Temperature, Exit Velocity, Emissions, UTM Coordinates (X,Y,Z)
- FUGITIVE DATA
  - Type, Length, Width, Temperature, Release Height, UTM Coordinates (X,Y,Z), Emissions

DATA PREPARATION PROCESS

- Multiple Source Plant can take up to 3-4 weeks and 40-60 engineering man hours to prepare data for model input for all emissions
  - Prepare site drawings
    - Full size drawing to scale showing buildings, stacks, plant property line, etc.
  - Collect emissions data
    - Emissions data on a point by point basis (hourly and annual)
  - Collect stack data
    - Height, diameter, exit velocity, temperature, location, base elevation
  - Collect building data
    - Building dimensions, base elevations, location

METEOROLOGICAL DATA

- ACQUIRE 5 YEARS OF MOST RECENT AVAILABLE REPRESENTATIVE DATA
- PERFORM DATA QUALITY ANALYSIS ON DATA
- GENERATE METEOROLOGICAL DATA FILES FOR USE IN MODEL

METEOROLOGICAL DATA USED

- WWW.WEBMET.COM
  - FREE
  - Upper Air Data – Dayton, Ohio – 1984-1991
  - Surface Data – Louisville, KY – 1984-1992
  - Must Perform Data Quality Analysis to Use Data in Model

DATA QUALITY ANALYSIS

- CHECK FOR MISSING OR BAD DATA
- REPLACE MISSING OR BAD DATA
  - "Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models" (EPA)

GENERATE METEOROLOGICAL DATA

- COMBINE UPPER AIR AND SURFACE STATION DATA FOR EACH OF 5 YEARS CHOSEN
  - GET ANEMOMETER HEIGHT FOR SURFACE STATION
  - ELEVATION OF SURFACE STATION
  - LAT/LONG OF SURFACE STATION
  - TIME ZONE OF SURFACE STATION

DIGITAL ELEVATION MAPS

- DIGITAL ELEVATION MAPS (DEM)
  - COVERING AREA OF MODELING DOMAIN
  - 7.5 MINUTE TERRAIN MAPS – 12 Files
    - www.webgis.com

TOPO MAPS

- TOPOGRAPHY MAPS OF MODELING DOMAIN CONVERTED TO:
  - DXF FORMAT IN UTM COORDINATES, ZONE 16, NAD 27
  - BITMAP FORMAT
    - LOCATE OPPOSING POINTS OF REFERENCE
    - UTM COORDINATES, ZONE 16, NAD 27

BUILDING DOWNWASH BPIP MODEL

- IMPORT PLANT SITE MAP
- DRAW BUILDINGS AND SPECIFY DIMENSIONS
  - UTM ZONE 16, NAD27
  - BASE ELEVATION
- DRAW STACKS AND SPECIFY DIMENSIONS
  - UTM ZONE 16, NAD27
  - BASE ELEVATION

RECEPTOR GRID DATA

- COARSE GRID – 1 KM SPACING OUT TO AT LEAST 5 KM IN EACH DIRECTION (10 KM BY 10 KM GRID)
- REFINED GRID – 100 METER SPACING GOING OUT AT LEAST 3.5 KM FROM FENCELINE
  - Determines point of maximum ambient concentration as required by the regulation.
- CAN ALSO ESTABLISH DISCRETE RECEPTORS
  - Determines ambient concentrations at a specific location

SET UP ISC3 MODEL

- STACK DATA
- FUGITIVE DATA
- BPIP DATA
- RECEPTOR GRID DATA
- PLANT BOUNDARY
- MODEL OPTIONS
  - Annual Averaging Time
  - Regulatory Default Option
- OUTPUT OPTIONS
  - High First High Values – Maximum Impact
  - Contributions of each modeled source
- MET DATA FILES
  - Upper Air – Dayton, Ohio – 1986-1990
  - Surface Data – Louisville, KY – 1986-1990

RUN ISC3 MODEL

- VERIFY RUNS AND CORRECT ANY ERRORS
- RUN MODEL
  - Separate runs for each TAC
  - Stack Sources – 2-3 hour run time for 5 years
  - Fugitive Sources – 1-3 days run time for 5 years
- REVIEW OUTPUT
- GENERATE MODEL RESULTS TABLES

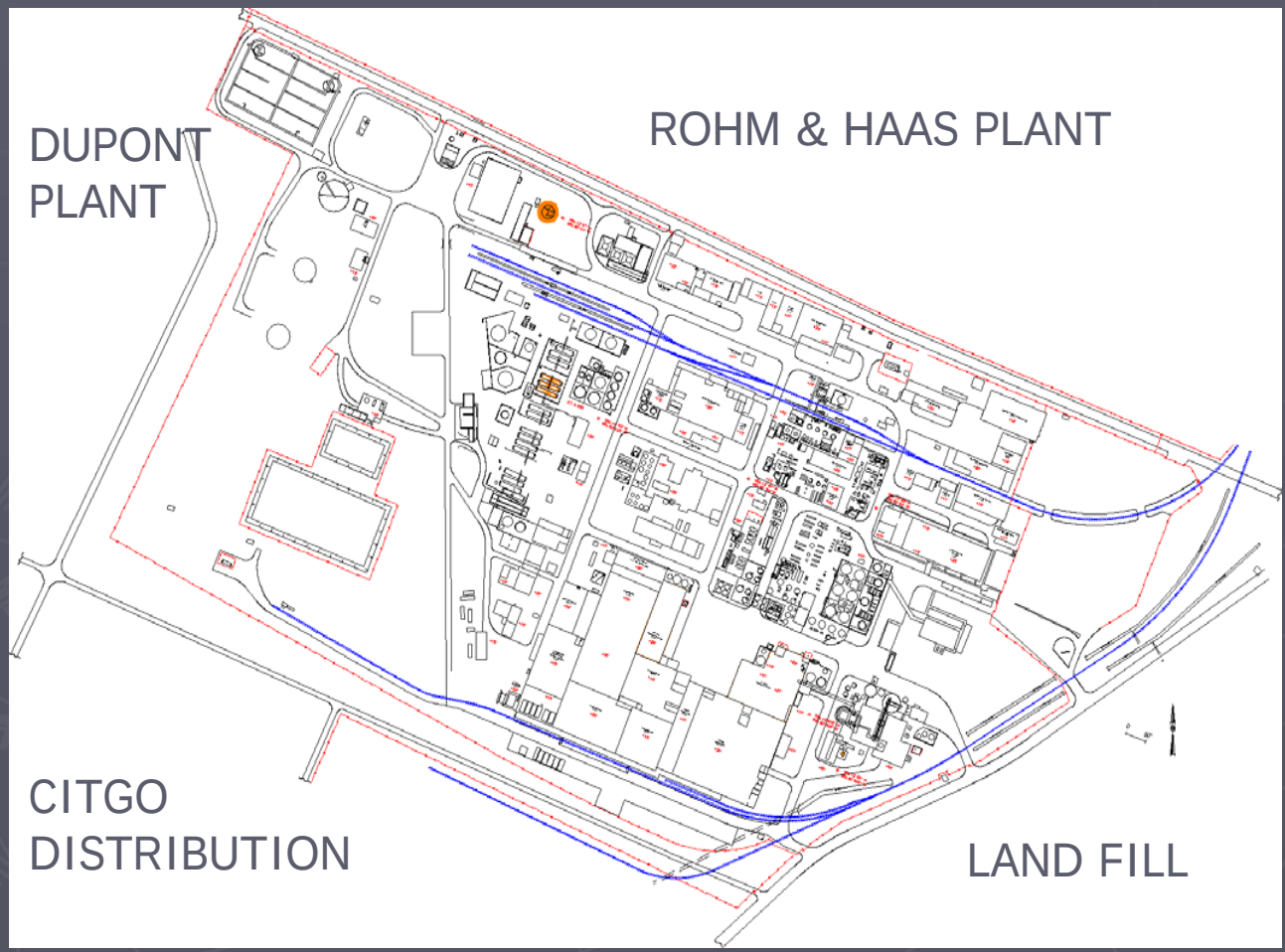
ASRC BOILER MODEL PRELIMINARY INFORMATION

- DETERMINE TACs THAT WILL BE EMITTED
  - EMISSION FACTOR SOURCE - AP-42
    - Coal – lbs of TAC per ton of coal burned
      - $2.6X10^{-4}$ lbs/ton total chromium
    - Natural Gas – lbs of TAC per mmcf of natural gas burned
      - $1.4X10^{-3}$ lbs/mmcf total chromium
- PERFORM MODEL FOR ALL BOILER RELATED TACs
  - Additional runs required for multiple stacks

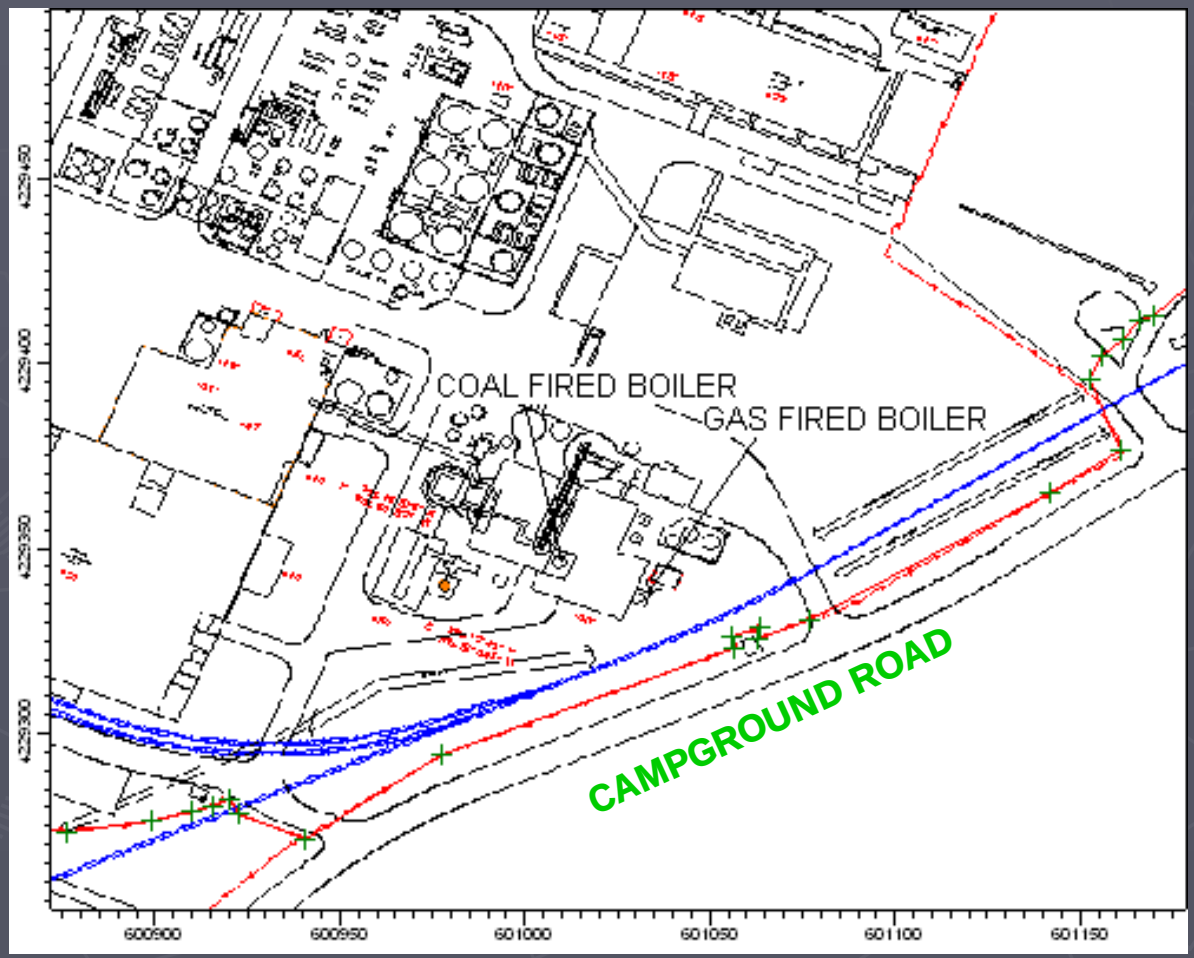
EMITTED CATEGORY 1 TACs

CAS No.	Compound	COAL BOILERS	GAS BOILERS
7440-38-2	**Arsenic & various arsenic compounds**	**X**	**X**
75-25-2	**Bromoform**	**X**	
7440-43-9	**Cadmium & various cadmium compounds**	**X**	**X**
67-66-3	**Chloroform**	**X**	**X**
7440-47-3	**Chromium & various chromium compounds**	**X**	**X**
106-46-7	**1,4-Dichlorobenzene**	**X**	**X**
50-00-0	**Formaldehyde**	**X**	**X**
75-09-2	**Methylene chloride [Dichloromethane]**	**X**	**X**
7440-02-0	**Nickel & various nickel compounds**	**X**	**X**

ASRC SITE MAP



ASRC BOILER LOCATIONS



FUEL RATE FOR BOILERS

- COAL FIRED BOILERS - 2
  - 18.12 Tons per hour coal burned
  - 212 mmBTU/hr Each
- NATURAL GAS FIRED BOILERS - 2
  - 0.099 mmcf Natural Gas Burned
  - 99 mmBTU/hr Each

EMISSION PARAMETERS

- SOURCES
  - COAL-FIRED BOILER
  - NATURAL GAS BOILER
- EMISSION DATA SOURCE
  - COAL FIRED BOILER
    - AP-42, TABLE 1.1-18 (Total Chromium & Chromium VI)
  - NATURAL GAS FIRED BOILER
    - AP-42, TABLE 1.4-4 (Total Chromium)

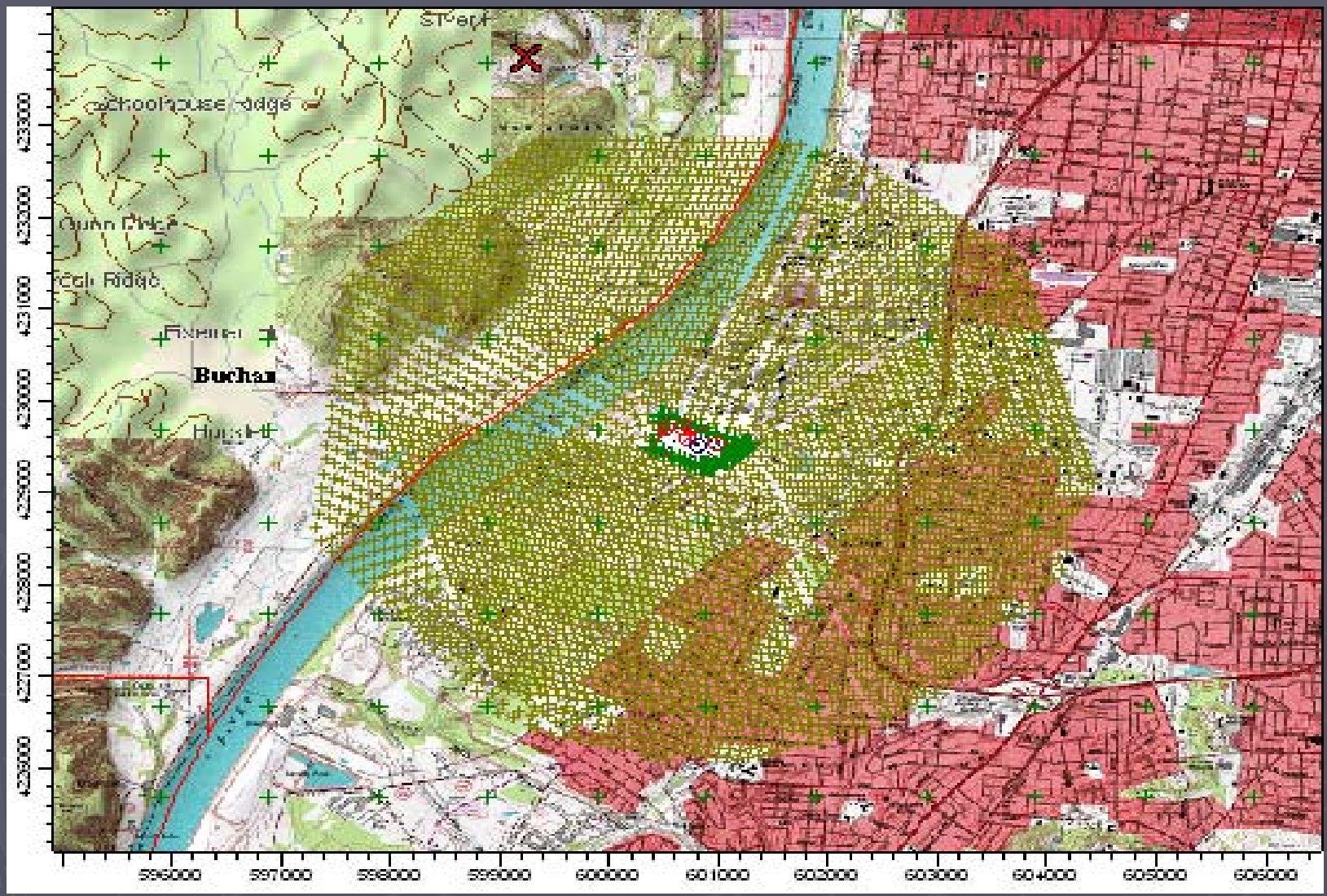
CHROMIUM SPECIATION FROM COAL COMBUSTION

- TOTAL CHROMIUM
  - AP-42, Table 1.1-18 – $2.6X10^{-4}$ lbs/ton
- HEXAVALENT CHROMIUM
  - AP-42, Table 1.1-18 – $7.9X10^{-5}$ lbs/ton
- TRIVALENT CHROMIUM
  - NO SPECIFIC AP-42 FACTOR
    - 30.4% (AP-42) Hexavalent
    - Assume 69.6% Trivalent

COAL FIRED BOILER EMISSIONS

- 18.12 TONS/HR COAL BURNED
- EMISSION FACTOR
  - Cr(total) = $2.6X10^{-4}$ lbs/ton
  - Cr(VI) = $7.9X10^{-5}$ lbs/ton
  - Cr(III) = $1.81X10^{-4}$ lbs/ton
- EMISSION CALCULATIONS
  - Cr(total)
    - 18.12 tons/hr X 0.00026 = $4.71X10^{-3}$ lbs/hr
    - $4.71X10^{-3}$ lbs/hr X 453.6 g/lb X 1 hr/3,600 sec = $5.94X10^{-4}$ g/s
  - Cr(VI)
    - 18.12 tons/hr X 0.000079 = $1.43X10^{-3}$ lbs/hr
    - $1.43X10^{-3}$ lbs/hr X 453.6 g/lb X 1 hr/3,600 sec = $1.80X10^{-4}$ g/s
  - Cr(III)
    - 18.12 tons/hr X 0.000181 lbs/ton = $3.28X10^{-3}$ lbs/hr
    - $3.28X10^{-3}$ lbs/hr X 453.6 g/lb X 1 hr/3,600 sec = $4.13X10^{-4}$ g/s

REFINED 100 METER RESOLUTION GRID



TAC MODELED

CAS No.	Compound	COAL BOILERS	GAS BOILERS
7440-38-2	Arsenic & various arsenic compounds	X	X
71-43-2	Benzene	X	X
75-25-2	Bromoform	X	
7440-43-9	Cadmium & various cadmium compounds	X	X
67-66-3	Chloroform	X	X
7440-47-3	**Chromium & Various Chromium Compounds**	**X**	**X**
106-46-7	1,4-Dichlorobenzene	X	X
50-00-0	Formaldehyde	X	X
75-09-2	Methylene chloride [Dichloromethane]	X	X
7440-02-0	Nickel & various nickel compounds	X	X

PRELIMINARY MODEL RESULTS

- FIVE YEAR SUMMARY TABLE
  - MAXIMUM ANNUAL IMPACTS AND LOCATIONS
  - VERIFY ACCURACY OF INPUT AND OUTPUT DATA
- COMPARED TO BACs CALCULATED BY LMAPCD
  - 18540-29-9 – 8.3X10-5 ug/m^3 BAC_c Hexavalent
  - 18540-29-9 – 8.3X10-3 ug/m^3 BAC_{nc} Hexavalent
  - 16065-83-1 – 5.0 ug/m^3 BAC_{nc} Trivalent

5 YEAR PRELIMINARY SUMMARY TABLE

		COAL AND GAS FIRED BOILERS					
YEAR	UTM COORD (meters)	TOTAL CR. MAX CONC. ug/m^3	CR VI MAX CONC. ug/m^3	CR III MAX CONC. ug/m^3	CR VI BAC_c ug/m^3	CR VI BAC_{nc} ug/m^3	CR III BAC_{nc} ug/m^3
1986		1.30E-04	3.95E-05	9.05E-05	8.30E-05	8.30E-03	5.00E+00
X	601,490.40						
Y	4,229,680.00						
1987		1.40E-04	4.26E-05	9.74E-05	8.30E-05	8.30E-03	5.00E+00
X	601,281.88						
Y	4,230,078.00						
1988		1.40E-04	4.26E-05	9.74E-05	8.30E-05	8.30E-03	5.00E+00
X	601,316.13						
Y	4,229,743.50						
1989		1.00E-04	3.04E-05	6.96E-05	8.30E-05	8.30E-03	5.00E+00
X	601,350.81						
Y	4,229,837.50						
1990		1.40E-04	4.26E-05	9.74E-05	8.30E-05	8.30E-03	5.00E+00
X	601,316.13						
Y	4,229,743.50						

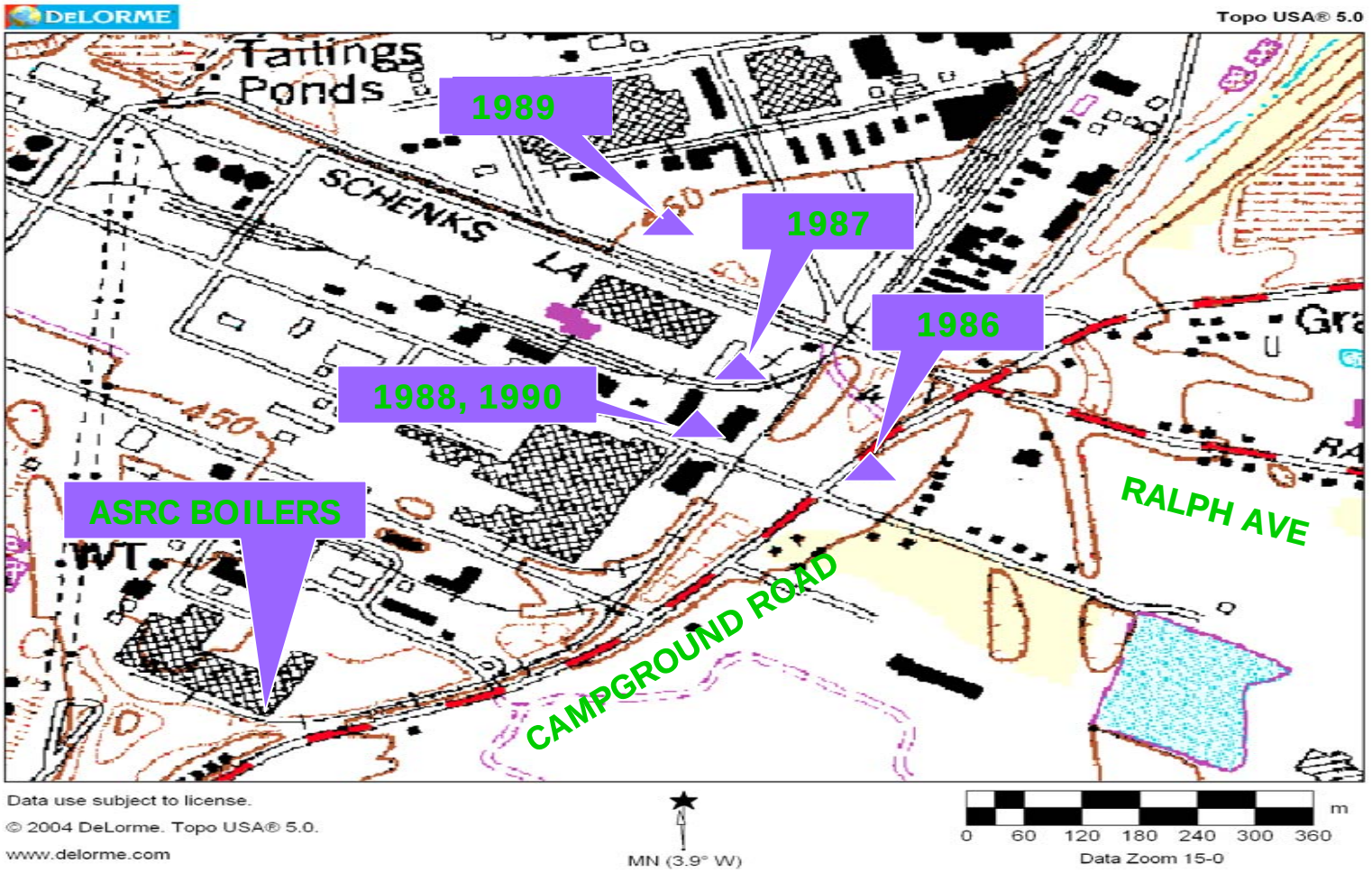
COAL FIRED BOILER IMPACTS

YEAR	UTM COORD (meters)	TOTAL CR. MAX CONC. ug/m^3	CR VI MAX CONC. ug/m^3	CR III MAX CONC. ug/m^3
1986		1.20E-04	3.65E-05	8.35E-05
X	601,490.40			
Y	4,229,680.00			
1987		1.30E-04	3.95E-05	9.05E-05
X	601,281.88			
Y	4,230,078.00			
1988		1.30E-04	3.95E-05	9.05E-05
X	601,316.13			
Y	4,229,743.50			
1989		1.00E-04	3.04E-05	6.96E-05
X	601,350.81			
Y	4,229,837.50			
1990		1.30E-04	3.95E-05	9.05E-05
X	601,316.13			
Y	4,229,743.50			

GAS FIRED BOILERS

YEAR	UTM COORD (meters)	TOTAL CR. MAX CONC. ug/m^3	CR VI MAX CONC. ug/m^3	CR III MAX CONC. ug/m^3
1986		1.00E-05	1.00E-05	1.00E-05
X	601,490.40			
Y	4,229,680.00			
1987		1.00E-05	1.00E-05	1.00E-05
X	601,281.88			
Y	4,230,078.00			
1988		1.00E-05	1.00E-05	1.00E-05
X	601,316.13			
Y	4,229,743.50			
1989		1.00E-05	1.00E-05	1.00E-05
X	601,350.81			
Y	4,229,837.50			
1990		1.00E-05	1.00E-05	1.00E-05
X	601,316.13			
Y	4,229,743.50			

LOCATION OF MAXIMUM CONCENTRATIONS



OBSERVATIONS AND CONCLUSIONS

USE OF ISC3 MODEL

- CANNOT SIMPLY DOWNLOAD ISC3 MODEL FROM INTERNET AND RUN
- NEED GRAPHICAL USER INTERFACE, WITH APPROXIMATE COST OF $6,000
- REQUIRES A TRAINED AND QUALIFIED MODELER TO OBTAIN AND VERIFY ACCURATE RESULTS
- AVAILABLE FREE MET DATA MUST BE ANALYZED TO MAKE USABLE IN THE MODEL OR MUST PURCHASE AT COST OF APPROXIMATELY $4,000

USE OF ISC3 MODEL (cont.)

- DATA REQUIRED IS COMPLEX
- FACILITIES WILL NOT ALWAYS HAVE THE REQUIRED DATA READILY AVAILABLE IN A FORM TO BE USED IN THE MODEL
- TIME AND EFFORT TO SET UP AND RUN THE MODEL

VARIABILITY OF THE MODELING RESULTS

- MAXIMUM CONCENTRATION OF A TAC MAY OCCUR AT DIFFERENT LOCATIONS AT DIFFERENT TIMES
- MAXIMUM CONCENTRATION OF DIFFERENT TACs MAY OCCUR AT DIFFERENT LOCATIONS
- MODELED RESULTS FOR DIFFERENT FACILITIES CANNOT BE SUMMED WITHOUT A STANDARD RECEPTOR GRID
  - MODELED MAXIMUM CONCENTRATIONS WILL NOT BE TEMPORALLY AND SPATIALLY CONSISTENT

IMPORTANCE OF CHROMIUM SPECIATION

- BASED UPON THIS EXAMPLE:
  - IF TOTAL CHROMIUM IS ASSUMED TO BE HEXAVALENT CHROMIUM, THE MODELED MAXIMUM AMBIENT CONCENTRATION (MAC) IS GREATER THAN THE BENCHMARK AMBIENT CONCENTRATION FOR CANCER (BAC_c)
  - IF AP-42 FACTOR FOR HEXAVALENT CHROMIUM IS USED FOR COAL COMBUSTION, THE MODELED MAC IS LESS THAN THE BAC_c

TIER 1, 2, 3 and 4
Cr(VI) Results Compared

Tier	Allowable Emissions	Implication
1	0.041 lb/yr	99.84% Less Than Tier 4
2	3.366 lb/yr	87.05% Less Than Tier 4
3	57.991 lb/yr	Single Boiler Complies
4	25.991 lb/yr	Single Boiler Complies
		All 4 Boilers Comply